A SOFTWARE TRACEABILITY APPROACH TO SUPPORT REQUIREMENT BASED TEST COVERAGE ANALYSIS

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ALHAMDULLILAH
I dedicated this thesis to
my parents,
Hj Omar Saman and Hjh Siti Rohani
My mothers Asmah Ismail,
Hjh Rosmah M.Y.
My spouse Rusdi Sembak
My children Marissa and Aaron
My sisters Fauziah, Fadilah,
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My brothers Faisal, Marzuqi, Azri
My relatives

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ABSTRACT

Requirement based test coverage (RBTC) is an important deliverable of a software testing process. There are problems in the process whereby the current RBTC analysis does not integrate with the black and white testing types nor does it generate a multi-direction RBTC analysis report. This research aims to address the problems by investigating RBTC analysis using software traceability and review its usefulness and efficiency. Initially, literature review on the comparison of the existing test coverage approaches and software was conducted followed by the development of a prototype using Java and MySQL. The prototype took into consideration the problems of RBTC analysis and this proposed concept which is RBTC Analysis using software traceability approach was modeled and constructed into a prototype called GRAYzer. Software artifacts from a bank project called 'Fleet Management System' (FMS) were used and embedded into the prototype. Questionnaires and feedback from FMS expert users of the prototype were collected. Data collected include the usefulness rating and time taken by the FMS experts and GRAYzer to do the RBTC analysis. A descriptive analysis of the data showed that a majority of the FMS experts rated the prototype as "Very Useful" and indicated that GRAYzer provided an efficient RBTC analysis. When compared to the test coverage approaches, the prototype provided a forward and backward test coverage analysis which can be used as analysis for any given artifact type. Besides that, it has also integrated gray box coverage types and multi-directions for the RBTC analysis. The research has shown that a software manager could use the prototype to quantify the effort needed by a team member and as a means to visualize the RBTC. However, this research did not cater for RBTC analysis after an artifact change and the source code was not catered for the class inheritance and polymorphism, and these could be viewed as future related works.

ABSTRAK

Liputan ujian berdasarkan keperluan (RBTC) adalah hasil penting dalam proses pengujian perisian. Antara masalah-masalah ketika dalam proses analisa RBTC terkini ialah tiada integrasi antara jenis-jenis pengujian kotak hitam dan putih serta tidak dapat menyediakan laporan analisa RBTC pelbagai arah. Penyelidikan ini bertujuan untuk menyingkap permasalahan analisa RBTC menggunakan jejakan perisian dan meninjau kebergunaan dan kecekapannya. Pada awal penyelidikan, terbitan kajian-kajian terdahulu difahami bagi membandingkan cara-cara liputan ujian dan perisian serta diikuti dengan pembangunan prototaip menggunakan Java dan MySQL. Prototaip diambil kira dalam permasalahan analisa RBTC dan konsep yang dicadangkan iaitu penganalisaan RBTC menggunakan jejakan perisian telah dimodelkan dan dibangunkan menjadi prototaip yang dinamakan sebagai GRAYzer. Artifak-artifak perisian dari projek bank yang dinamakan sebagai 'Fleet Management System' (FMS) digunakan dan dibenamkan ke dalam prototaip. Soal selidik dan maklum balas dari pakar FMS terhadap prototaip dikumpulkan. Data yang telah dikumpulkan termasuk taraf kebergunaan dan masa yang diambil oleh pakar-pakar FMS dan GRAYzer dalam menganalisa RBTC. Analisa deskriptif menunjukkan bahawa majoriti pakar-pakar FMS menarafkan prototaip ini sebagai "Sangat Berguna" dan menunjukkan bahawa GRAYzer dapat menyediakan analisa RBTC yang cekap. Apabila dibandingkan dengan cara-cara liputan ujian, prototaip ini dapat menyediakan analisa liputan ujian secara ke depan dan undur yang boleh digunakan untuk menganalisa pelabagai jenis artifak. Disamping itu, ia dapat mengintegrasi jenis-jenis liputan ujian kotak kelabu serta analisa RBTC pelbagai arah. Kajian menujukkan, dengan menggunakan GRAYzer, seseorang pengurus perisian dapat mengira usaha untuk ahli-ahli kumpulan dan sebagai cara untuk melihat RBTC secara visual. Namun, kajian ini tidak meliputi analisa bagi perubahan artifak dan tidak mengambil cara perwarisan dan polimorfisme, di mana kedua-duanya boleh dilihat sebagai kajian-kajian pada masa hadapan.